BTEC Assignment Brief

Qualification	Pearson BTEC International Level 3 Subsidiary Diploma in Engineering Pearson BTEC International Level 3 Foundation Diploma in Engineering Pearson BTEC International Level 3 Diploma in Engineering Pearson BTEC International Level 3 Diploma in Electrical/Electronic Engineering Pearson BTEC International Level 3 Diploma in Mechanical Engineering Pearson BTEC International Level 3 Diploma in Computer Engineering Pearson BTEC International Level 3 Diploma in Manufacturing Engineering Pearson BTEC International Level 3 Diploma in Aeronautical Engineering Pearson BTEC International Level 3 Extended Diploma in Engineering Pearson BTEC International Level 3 Extended Diploma in Electrical/Electronic Engineering Pearson BTEC International Level 3 Extended Diploma in Mechanical Engineering Pearson BTEC International Level 3 Extended Diploma in Computer Engineering Pearson BTEC International Level 3 Extended Diploma in Manufacturing Engineering Pearson BTEC International Level 3 Extended Diploma in Aeronautical Engineering
Unit number and title	**Unit 25: Mechanical Behaviour of Metallic Materials**
Learning aim(s)	**C:** Explore the in-service failure of metallic components and consider improvements to their design
Assignment title	Investigating in-service failure of components and proposing design changes to improve their performance.
Assessor	
Issue date	
Hand in deadline	

Vocational Scenario or Context	You are working as an apprentice technician for a large company that manufactures hydraulic systems and airframe components for the aerospace industry. The quality manager is impressed with your excellent knowledge about the mechanical properties of metals and your ability to carry out practical investigations. They now move you into the life cycle testing team so you can work with colleagues who have responsibility for carrying out endurance tests on components. The data collected is used to influence improvements in service critical components working in stress environments that could lead to fatigue or creep failure and corrosion unless monitored. You will also be involved in the component redesign process.

Task 1	You are going to inspect engineered components that have failed in service, to establish the causes of failure and propose design modifications to prevent the problems from reoccurring. You will be investigating mechanical failure, for example fatigue, and failure due to corrosion. Mechanical failure is when a component breaks or becomes unserviceable (fatigue cracks or creep). Corrosive failure is when a component suffers from surface degradation (e.g. rusting). Use a log book to record all data, information and images. **To do this:** Your tutor will provide you with a small selection of components and information about the loading conditions under which they operated for a significant period of time. **You need to:** • Visually inspect at least two components which have suffered mechanical failure (creep and fatigue) and identify the causes of the failure modes/problems, for example looking for the classic signs of fatigue (crack propagation, growth, crystalline tear) by comparing with reference sources. Support your investigations with mechanical testing, for example, by safely carrying out a hardness check. • Visually inspect a component which has corroded to the point of making it unserviceable. • Investigate design changes that will prevent or mitigate the problems that you have identified. Design changes could be modifications to the physical shape of a component (e.g. reducing the impact of stress raisers by smoothing out abrupt changes of cross section), changing the material from which the component is made (e.g. improved performance properties at high temperature) or a higher grade of surface protection (e.g. hard anodising). **You then need to:** Present your findings in an organised technical report which should include: • Annotated images of the examined components. • Detailed annotated images of failed surfaces/components and information about why the failure occurred, with reference to mechanical design principles. • A range of design improvements for the failed components, with reference to mechanical design principles to justify the suggested modifications.
Checklist of evidence required	A portfolio containing a log book and report including annotated images and commentary, test results, sketching, learner observation record etc.

Criteria covered by this task:	
Unit/Criteria reference	To achieve the criteria you must show that you are able to:
25/C.D3	Evaluate, using language that is technically correct and of a high standard, the results from safely conducted and accurate checks and tests to establish how components failed in service, recommending a design solution from a range of alternatives.
25/C.M4	Conduct a visual inspection check and at least one test safely and accurately on components that have failed in service.
25/C.M5	Analyse, using the results, how each component failed and justify how each component's design could be improved.
25/C.P6	Conduct a visual inspection check and at least one test safely on components that have failed in service.
25/C.P7	Explain, using the results, how each component failed and how each component's design could be improved.
Sources of information to support you with this Assignment	Books Materials for Engineers and Technicians 6th Edition; Bolton W, Higgins R A; Routledge, 2014; ISBN 978-1138778757 Websites matweb.com makeitfrom.com
Other assessment materials attached to this Assignment Brief	Reference images Components, each accompanied by information about the conditions under which it has been operating, for example, loading, temperature, environment (e.g. corrosive)